MODEL 8037

TRANSIENT GENERATOR

OPERATIONS AND SERVICE MANUAL

PACIFIC

POWER SOURCE CORP.

CERTIFICATION

Pacific Power Source Corporation certifies that this instrument was thoroughly tested and inspected and found to meet or excel its published specifications when it was shipped from the facility.

WARRANTY

Pacific Power Source Corporation warrants each unit to be free from defects in material and workmanship. For the period of two years after purchase, Pacific Power Source Corporation will repair or replace any unit returned to our plant in Huntington Beach, California, by the original buyer, with shipping both ways prepaid by the buyer. Pacific Power Source Corporation is not responsible for consequential damage arising from the use of its equipment.

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PACIFIC PART NO. 109250

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PACIFIC POWER SOURCE CORPORATION
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SECOND EDITION

MODEL 8037 TRANSIENT GENERATOR

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FIGURE 1.1
MODEL 8037
TRANSIENT GENERATOR

1.0 GENERAL DESCRIPTION

1.1 General Performance

The Model 8037 Transient Generator is a single generator which, when used in conjunction with a compatible AC Power Source, produces amplitude and frequency transient excursions. These excursions are capable of similating the various transient envelopes of MIL-STD-1399, MIL-E-16400 and MIL-STD-704A. The signal generator has a nominal mode permitting its use as a variable steady state signal generator for single phase, three phase delta and three phase Y outputs. It also has a transient mode which retains all of the nominal operating conditions plus superposed amplitude and frequency transients as selected by front panel controls. It has an external operation mode permitting nominal operating conditions plus transient conditions as prescribed by external low level DC voltages.

1.2 Performance Specifications

Frequency Control: Two continuously variable ranges 20-200 and 200-2000 Hz, plus three precision fixed frequencies at 50, 60, 400 Hz.

Amplitude Control: Continuously variable 0 to V max. Three phase units include balance controls for each phase with a range of $\pm$10%.

Phase Separation Accuracy: 1^{o} max.

Signal Distortion: 0.5% max.

Amplitude Stability: 0.02% per ^{o}C.

Frequency Stability: 0.02% per ^{o}C.

Freq. Meter Accuracy: 0.50% $\pm$ 1 digit

Freq. Meter Resolution: 0.1 Hz on 20-200 range
1.0 Hz on 200-2000 range

Voltmeter Function: Nine position function switch permits user to monitor volts any phase to neutral, volts phase to phase.

Voltmeter Accuracy: 0.50% $\pm$ 1 digit

Output Voltage: 0 to 5 Vrms

1.2 Performance Specifications Continued

Output Impedance: < 1 OHM

Output Current: 10 MArms maximum

Rise Time: .01 to 1.0 seconds, double exponential time constant

Rise Time Accuracy: 2% minimum

Fall Time: .01 to 1.0 seconds, double exponential time constant

Fall Time Accuracy: 2% minimum

Delay (pulse width): .01 to 1.0 seconds

Delay Accuracy: 2% minimum

Time Base Extension: To 10 seconds using external 100uf capacitors.

External Trigger: +12V, leading edge.

Transient Frequency Range: 0 to ± 10 Hz on 20-200 Hz range; 0 to ± 100 Hz on 200-2000 Hz range.

Transient Voltage Range: 0 to ± 100% of setting to 5 Vrms maximum.

Monitor Scale Factors: Voltage, ± 5V = ± 100%
Frequency, ± 5V = ± 100 Hz on 200-2000 range
± 5V = ± 10 Hz on 20-200 range

1.3 Operating Characteristics

1.3.1 Nominal Operation Mode

In the nominal operations mode, the signal generator functions as a variable frequency, variable amplitude signal generator with performance specifications as follows:

1.3.1.1 Outputs

Single phase, three phase delta and three phase Y outputs are available. Signal levels are 5 volts RMS. Three phase vectors are produced with a maximum phase error of 1^{o}. Output waveforms are sinusoidal, with a maximum distortion of 0.25 percent.

1.3.1.2 Frequency Range

The nominal frequency range is 20-2000 Hz in two selectable ranges.

1.3.1.3 Amplitude Controls

Amplitude is continuously variable from 0 to 5 volts RMS. When used for three phase signal generation balance controls are provided with a control range of ±5% about their nominal settings.

1.3.1.4 Metering

The signal generator is fully metered with dual 3½ digit displays for frequency and voltage amplitude, with suitable selector switches to permit monitoring of each phase voltage for three phase outputs. Metering accuracy is 0.5% for both volts and frequency. A selector switch is provided for monitoring either generator output or system output.

1.3.2 Transient Mode

In the transient mode, the signal generator will continue to produce output signals at their nominal settings, but on actuation by the operator or by external logic level stimulation, will superpose either voltage transients or frequency transients or both, whose envelope dimensions have been predetermined by panel controls. Voltage and frequency transients are generated by independent time based generators which can be set to different dimensions and initiation times.

1.3.2.1 Output Configurations

At all times during the transient, the phase error between output phases will not exceed 1°. Phase voltage levels will not unbalance by more than 1%.

1.3.2.2 Transient Envelope Dimensions

The transient envelope has operator selectable duration time (Td), rise time (Tr) and fall time (Tf). Tr is variable from 0.01 to 1.0 seconds. Td is variable from 0.01 to 1.0 seconds. Tf is variable from 0.01 to 1.0 seconds. The shape of the transient is double exponential filtered, with time constant selection equal to Tr and Tf, respectively.

1.3.2.3 Transient Amplitude

The amplitude transient is capable of introducing an output voltage excursion up to ± 100%, continuously variable by precision dial. The frequency transient is capable of producing a frequency excursion of ± 100 Hz also continuously variable by precision dial on the 200-2000 Hz range and ± 10 Hz on the 20-200 Hz range.

1.3.2.4 Transient Initiation

The voltage and frequency transient are capable of independent initiation, or both simultaneously, by either operator front panel controls or by external logic level signals.

1.3.2.5 Transient Monitor

The signal generator produces output signals whose DC voltage is proportional to amplitude and frequency excursions during the transient. The monitor signal levels are representative of the excursions with an accuracy of ±1%.

1.3.3 External Mode

The signal generator includes an external mode in which the signal generator produces steady state signals at their nominal settings, but with amplitude and frequency excursions in response to an externally applied DC control signal. Signal levels of 5 volts DC will produce maximum frequency and amplitude excursions.

1.3.4 Power Input

115V AC, 1Ø, 60 Hz

1.3.5 Mechanical

Rack mountable 5¼" x 19" x 17"

1.3.6 Environmental

1.3.6.1 Cooling

Ambient

1.3.6.2 Operating Temperature

0° to 45°C

1.3.6.3 Storage Temperature

-25° to 85°C

1.3.7 Electrical Safety Requirements

The equipment is provided with a main circuit breaker and suitable protective devices for all individual circuits.

1.4 Transient Test Set-Up

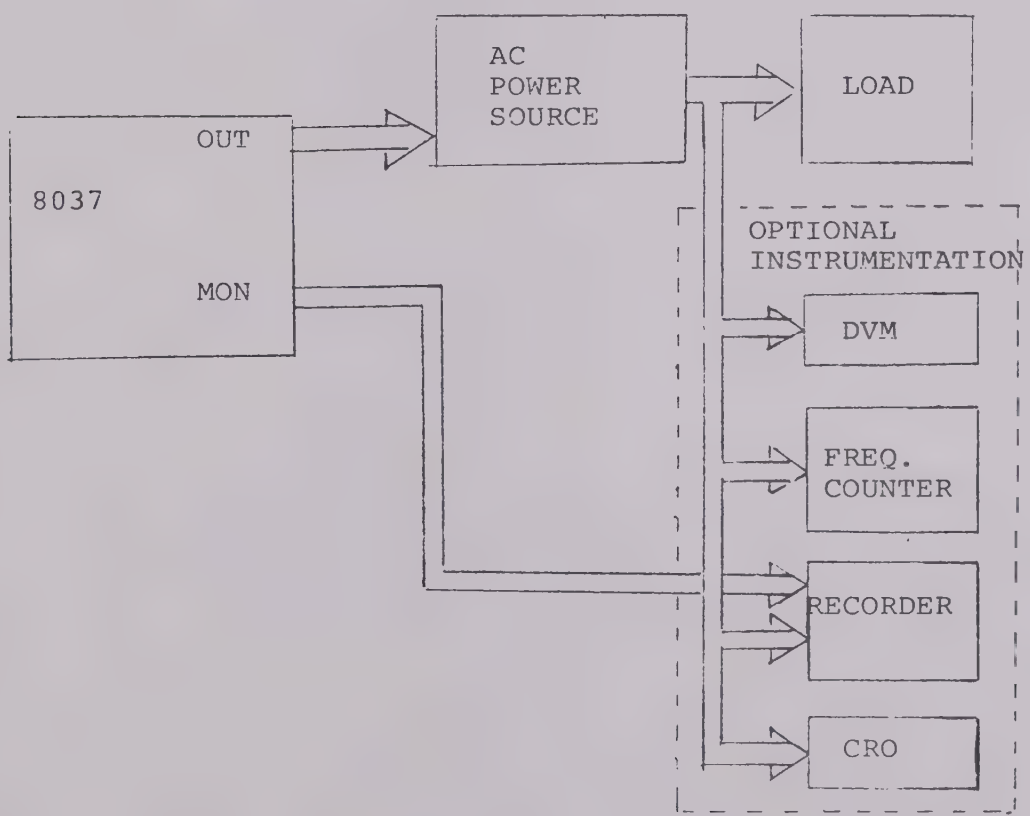
The 8037 Transient Generator was designed to be compatible with Pacific AC Power Sources but can be operated with any linear power system with a 5 volt input signal and compatible bandwidth. Monitor outputs are provided to facilitate setting up transients on an oscilloscope and recording them on a recorder. A typical test set-up is depicted in Figure 1.2

1.5 Setting a Transient

To set up a transient, all that is required is an oscilloscope; the optional instrumentation depicted in Figure 1.2 will allow checking the accuracy of settings and making hard copy recordings of transient envelopes. To set up a transient, perform the following steps:

1.5.1 Nominal Conditions

Switch the mode switch to "Nominal" and set up the nominal voltage and frequency conditions; the load should be disconnected while setting up the transient.



TYPICAL TRANSIENT TEST SET-UP
FIGURE 1.2

1.5.2 Transient Limits

Switch the mode switch to "Calibrate", and set the maximum limits of the transient with tbe polarity switches and amplitude controls as indicated by the digital instrumentation on the 8037 or by external instrumentation.

If a strip chart recorder is being used to make a hard copy of the transient, this is a good time to calibrate the scale of the recorder.

1.5.3 Transient Execution

Switch the mode control to "Operate"; the conditions will return to nominal and remain there until a transient is executed. Transients for either voltage, frequency, or V + F may be initiated by pushing the applicable front panel button.

Transients may also be initiated by applying a positive 12 volt pulse to either or both trigger inputs.

1.5.4 Rise Time

The rise time of the transient is set by the rise time control; voltage and frequency are independent and are set by calibrated vernier dials. The rise time is a double exponential filter with time constants equal to that selected. Note that with a long rise time, full transient amplitude will not be reached.

1.5.5 Fall Time

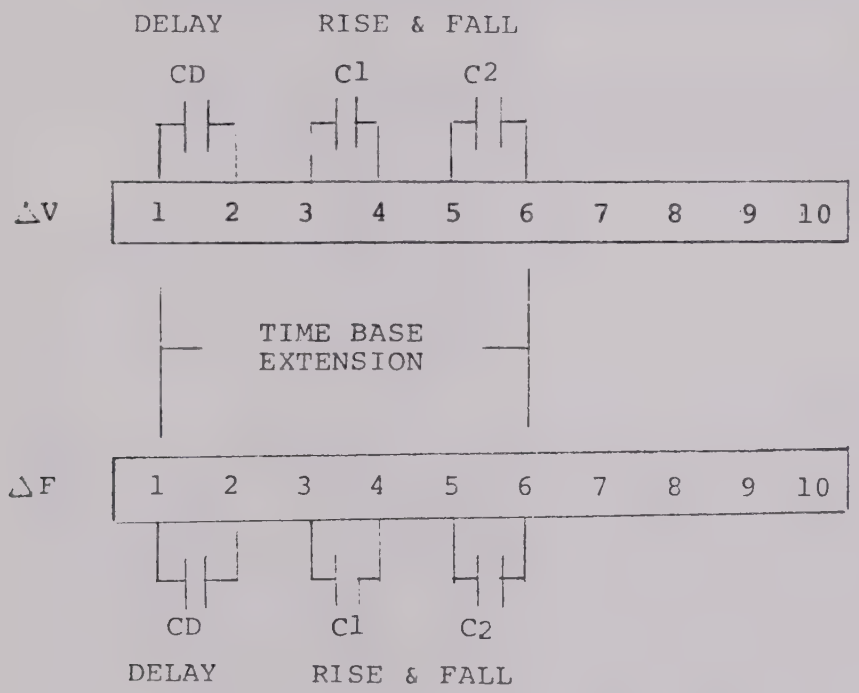
The fall time of the transient is set by the fall time control; voltage and frequency are independent and are set by calibrated vernier dials. The fall time is a double exponential filter with time constants equal to that selected.

1.5.6 Transient Duration

The transient duration is set by the delay control; voltage and frequency duration are independent and are set by calibrated vernier dials. They may be checked by setting rise and fall times to minimum and measuring the output with a scope or time interval counter.

1.5.7 Time-Base Extension

The time-base of any of the rise, delay or fall controls may be extended by adding external capacitors across the proper terminals on the rear panel. The internal capacitor is 10uf so that a 100uf external part would extend the range to 10 seconds. For rise or fall times, two capacitors are necessary to preserve the double exponential characteristic. Each capacitor will extend both the rise and fall times.



2.0 TECHNICAL DESCRIPTION

2.1 Theory of Operation

The 8037 Transient Generator can best be described by considering it as two sub-assemblies in a chassis; these sub-assemblies are:

1) 3-D digital plug-in, a 3Ø digital signal generator complete with readouts for voltage and frequency; this unit is modified to provide voltage and frequency durations proportional to applied voltages. A complete description is provided in the accompanying 3-D manual.

2) Transient Generator board, a PC board assembly containing two pulse generating channels; all parameters affecting the shape of the pulses can be accurately set by precision front panel controls. See figure 2.1 for a block diagram.

2.2 Transient Generator Board

2.2.1 Theory of Operation

Refer to figures 2.1 and 2.2.1 with this description.

There are two indentical channels and only the voltage channel is described. One shot Z1, generates a pulse of approximately 1.1 RC which sets the pulse width by controlling the gating of all the FET switches. The quad FET switch, Z2 , is wired as a DPDT switch. The rise time is determined by the timing capacitors C4 and C5 and the front panel rise time control charging towards +5V; the fall time is then determined by the front panel fall time control discharging towards ground. Amplifiers A1 and A2 buffer the timing capacitors while A3 inverts to output of A2. The polarity switch selects either the positive or negative going transients A2 or A3 and runs the signal through the amplitude control into buffer A6. The output of A4 goes to the monitor jacks and into the scaling circuit A5. This output becomes the voltage reference for the 3-D plug-in.

The frequency channel is identical except that the scaling amplifier A10 has a current output with a 3 volt common mode output voltage.

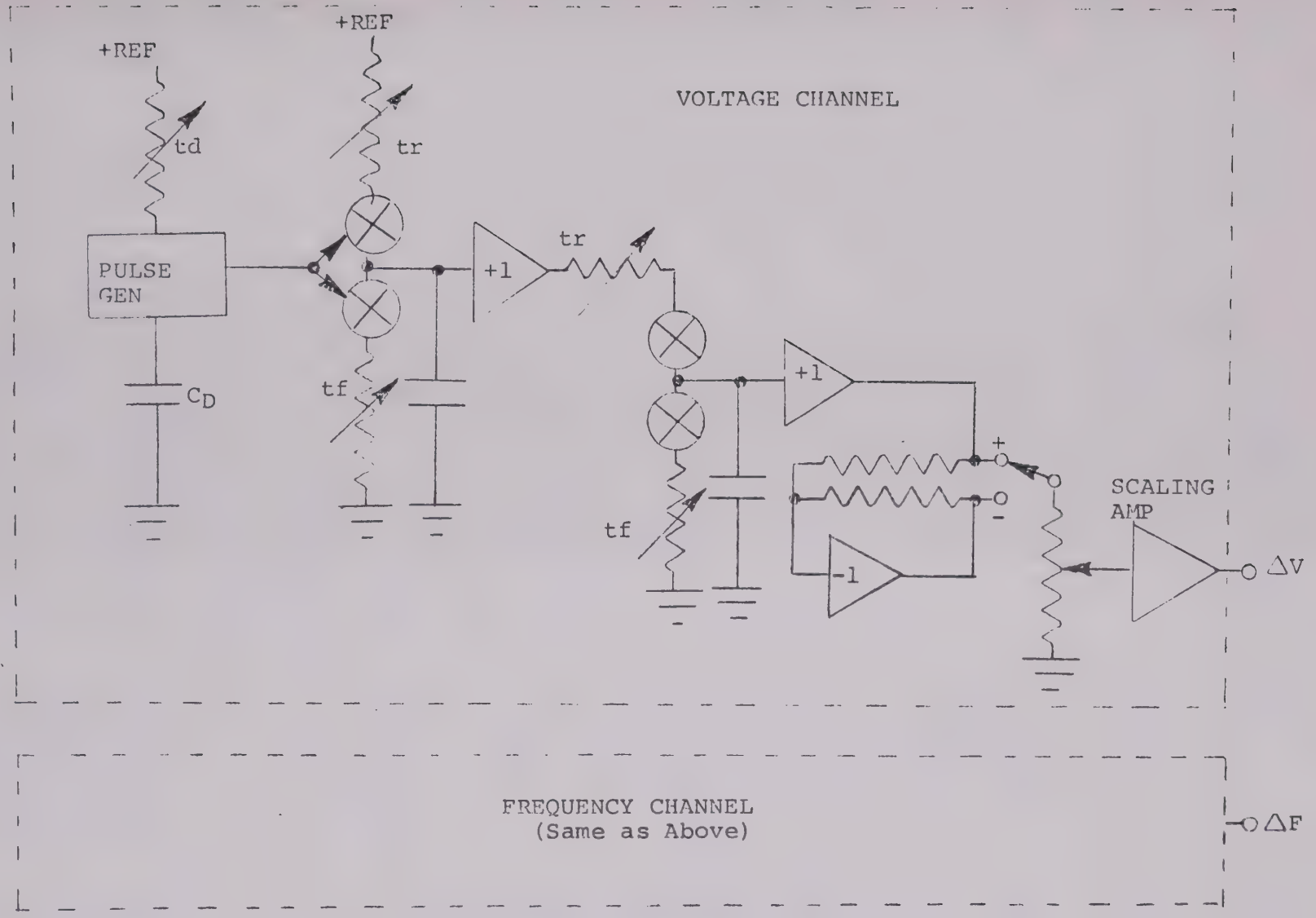


FIGURE 2.1 TRANSIENT GENERATOR BOARD - BLOCK DIAGRAM

2.1.1

PARTS LIST TRANSIENT GENERATOR BOARD DRAWING NO. 109260-4

ITEM	DESCRIPTION	MFG P/N	MFG	QTY
	PRINTED CIRCUIT BOARD	109260	PPSC	1
	INTEGRATED CIRCUIT Z1,4	NE555		2
	INTEGRATED CIRCUIT Z3,5	CD4011	RCA	2
	INTEGRATED CIRCUIT Z2,6	CD4016	RCA	2
	AMPLIFIER A1-10	LM741-C	FAIRCHILD	10
	REGULATOR +5V V3	MC7805CT	MOT.	1
	REGULATOR +12V V2	MC7812CT	MOT.	1
	REGULATOR -12V V1	MC7912CT	MOT.	1
	DIODES SIGNAL CR1-10	IN4005	MOT.	10
	CAPACITOR .05C500V C1,2,6,7,10,11		SPRAGUE	12
	CAPACITOR 10uf@50V C3-5,8,18		ELECTROCUBE	6
	CAPACITOR .47@50V C21-23		SPRAGUE	3
	CAPACITOR 200uf@50V C19,20		SPRAGUE	2
	RESISTOR 1K 5% C 1/4W R1-4,17-20	RN55C1001		8
	RESISTOR 100 5% C 1/4W R8,11,15,22, 27,31,42-49			14
	RESISTOR 10K 5% C 1/4W R14,30,41			3
	RESISTOR 1K 1% 1/8W R5,6,7,9,10,21, 23-26		A-B	10
	RESISTOR 10K 1% R12,13,28,29,40	RN55C1002	A-B	5
	RESISTOR 20K 1% R38,39	RN55C2002	A-B	2
	RESISTOR 15K 1% R37	RN55C1502	A-B	1
	RESISTOR 200K 1% R32-35	RN55C2003	A-B	4
	PRECISION RESISTOR, S.A.T. R36			1
	CONNECTOR, MOLEX 15 PIN J1-J3		MOLEX	3

PARTS LIST 8037 TRANSIENT GENERATOR DRAWING NO. 109200-4

ITEM	DESCRIPTION	MFG/SN	MFG	QTY
	FRONT PANEL	109201	PPSC	1
	TURNS COUNTING DIAL	461	KILO ENG	8
	POTENTIOMETER DUAL 100K R1,3,5,7	35405-135-104/104	BOURNS	4
	POTENTIOMETER DUAL 100K R2,4,6,8	35404-1-104	BOURNS	4
	SWITCH, 4PDT, LEVER S7	2F24SC291	C&H	1
	SWITCH, 5PDT, LEVER S4,5,6	2F21SC291	C&H	3
	SWITCH, MOMENTARY PUSHBUTTON S1,2,3	SA415DW11-2	C&H	3
	CONNECTOR, BNC J4-12	4890-7	BENDIX	9
	HANDLE	2050	SMITH	2
	FERRULE	2055	SMITH	4
	SWITCH, ROTARY S8	339429K	OAK	1
	SWITCH BEZEL (REF #13)	SW2AA10	C&H	3
	TRANSFORMER T1	531089	PPSC	1
	3-D OSCILLATOR ASSY.	108300	PPSC	1
	TRANSIENT BOARD ASSY.	109260	PPSC	1
	TERMINAL STRIP	599-2004-10	KULKA	2
	CONNECTOR P1	M53102A22-145	AMPHENOL	1
	FUSE HOLDER	FH1342028L	LITTLEFUSE	1
	FUSE 1A 3AG	F1314001	LITTLEFUSE	1
	POWER CORD	17419	BELDEN	1

PARTS LIST 8037 TRANSIENT GENERATOR DRAWING NO. 109200-4

ITEM	DESCRIPTION	MFG/SN	MFG	QTY
	STRAIN RELIEF	R6-A	RICHO	
	SPEED NUT		TINNERMAN	12
	5¼" BOX 1 PIECE ASSY.	109210	PPSC	1
	LAMP CARTRIDGE PL1	CR03-RC5-N117	ELDEMA	1
	LAMP SOCKET PL1	515-0012	DIALIGHT	1
	SPEED CLIP PL1	515-0051	DIALIGHT	1
	KNOB	KN701A 1/4	ALCO	1
	INSULATION STRIP	102821	PPSC	2
	SLIP-ON CAP	SW49AA31	C&H	1
	CONNECTOR 15 PIN FEMALE	J1,J2,J3,2J1	MOLEX	4
	RESISTOR, 1K 1/4W 5% CARBON			2
	RESISTOR, 10K 1/4W 5% CARBON			2

3.0 CALIBRATION AND ALIGNMENT

3.1 Requirements

Pacific Power Source Corporation recommends that the calibration procedure be performed at six-month intervals or if the unit has undergone major repairs.

3.2 3-D Plug-In Calibration Procedure

The calibration procedure for the 3-D plug-in is given in the accompanying 3-D manual; refer to it for complete instructions. The unit should be operated in the normal mode position during 3-D calibration.

3.3 Transient Generator Calibration

3.3.1 Rise Time, Delay and Fall Time Calibration

The scale of the rise time, delay and fall time are set by precision components and do not need calibration. Set all controls at 1.0 seconds and verify normal operation by monitoring A5-6 and A6-6.

3.3.2 Frequency Transient Scaling

Set the mode switch to normal, frequency range to 200-2000 Hz and set frequency to 400 ± 1 Hz. Switch mode switch to calibrate and frequency transient to +100%; adjust R36 for a frequency reading of 500 ± Hz. Frequency transient scaling is now in calibration.

3.3.3 Voltage Transient Scaling

Voltage transient scaling is preset by precision resistors R38, R39 and R40 and should need no alignment. To verify proper operation, set mode switch to normal and monitor A5-6; the level should be -2.5V±0.5VDC. Switch the mode switch to calibrate and set the voltage transient to -100%; observe A5-6 to be 0±50MVDC. If out of tolerance, it may be necessary to pad R39.

3.3.4 Monitor Scab Factors

To measure monitor scale factors, set amplitude controls to +100%, mode to calibrate, and measure scale factors on ΔV monitor and ΔF monitor with a DVM. The value will be 5V±0.25V, and will be stable to ±.05V for calibration purposes.

3-D MODIFICATION 8037

TRANSIENT GENERATOR COMPATIBILITY

This 3-D plug-in has been modified for operation in a Model 8037 Transient Generator. The mod consists of adding a harness and connector to interface with the chassis.

Electrically the mod attaches wires to the current input terminal of the clock generator and the reference voltage for the DAC and a ground terminal. This allows modifying the clock rate or the output voltage by the signals generated by the transient generator board.

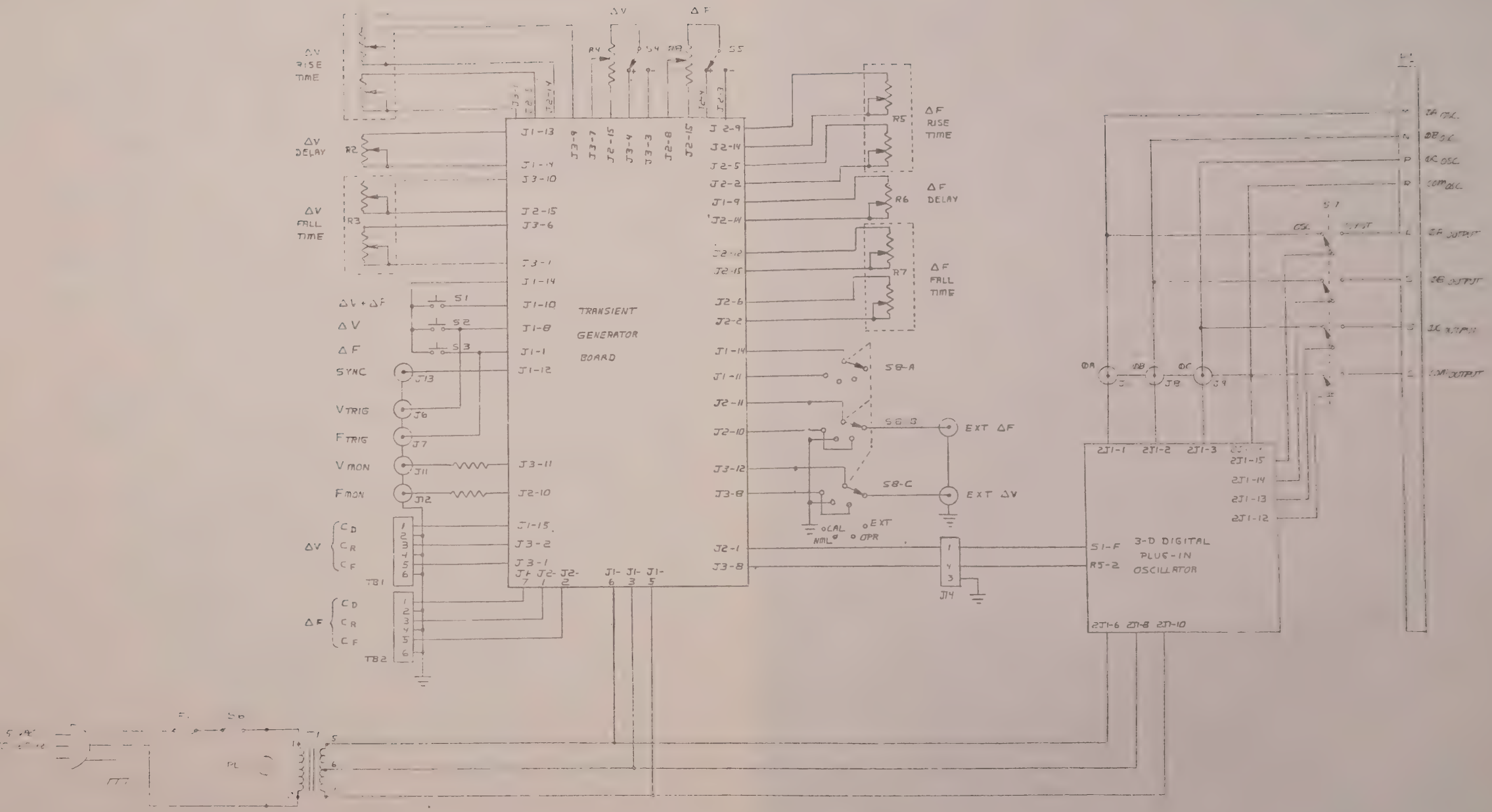
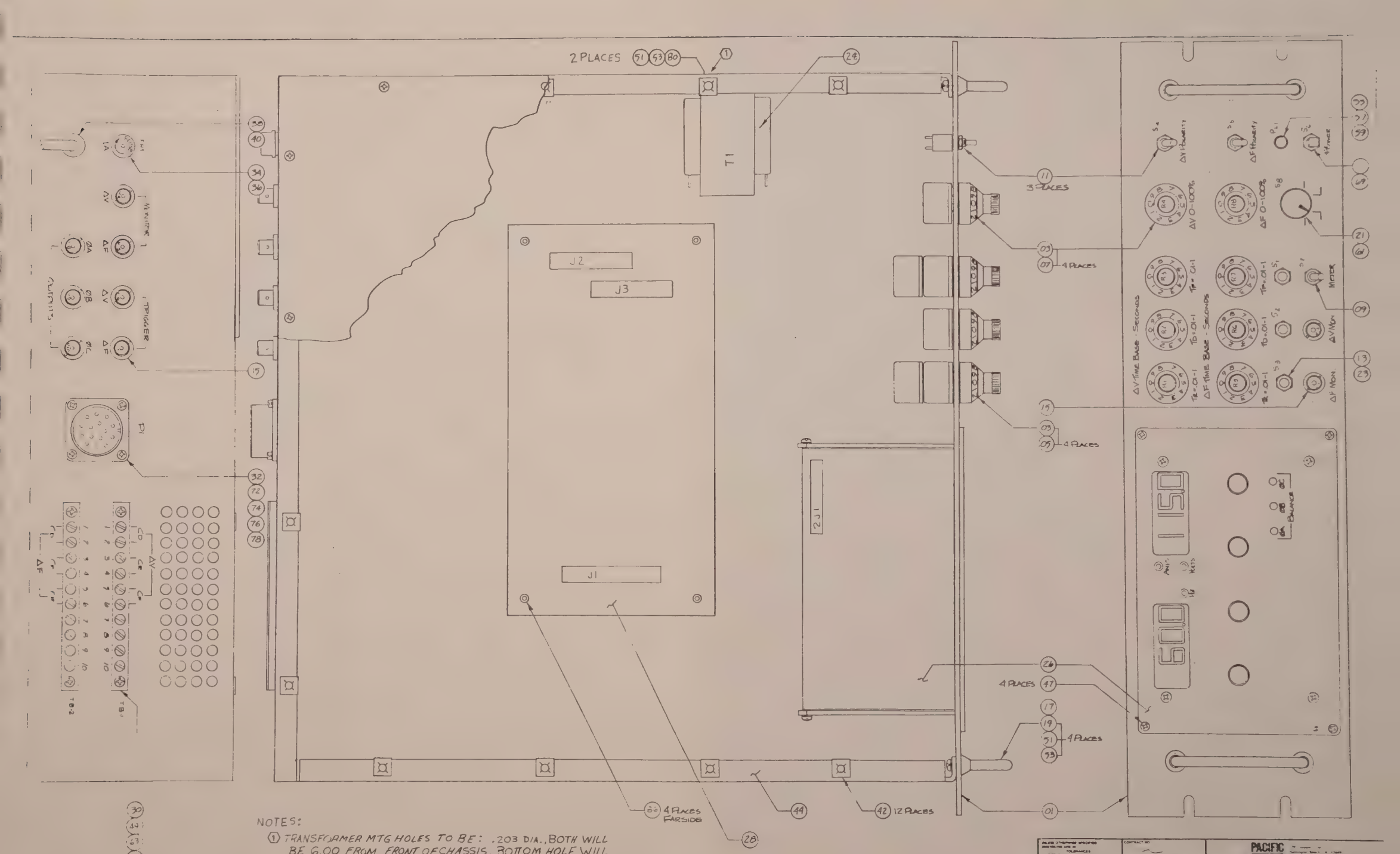


FIGURE 2.1.1
SYSTEM WIRING DIAGRAM



NOTES:

① TRANSFORMER MTG HOLES TO BE: .203 DIA., BOTH WILL BE 6.00 FROM FRONT OF CHASSIS, BOTTOM HOLE WILL BE .875 FROM BOTTOM OF CHASSIS, TOP HOLE WILL BE 4.00 FROM BOTTOM OF CHASSIS

			PACIFIC
		MAW	TRANSIENT GENERATOR
			5037

FIGURE 2.1.2
TRANSIENT GENERATOR
ASSEMBLY DRAWING

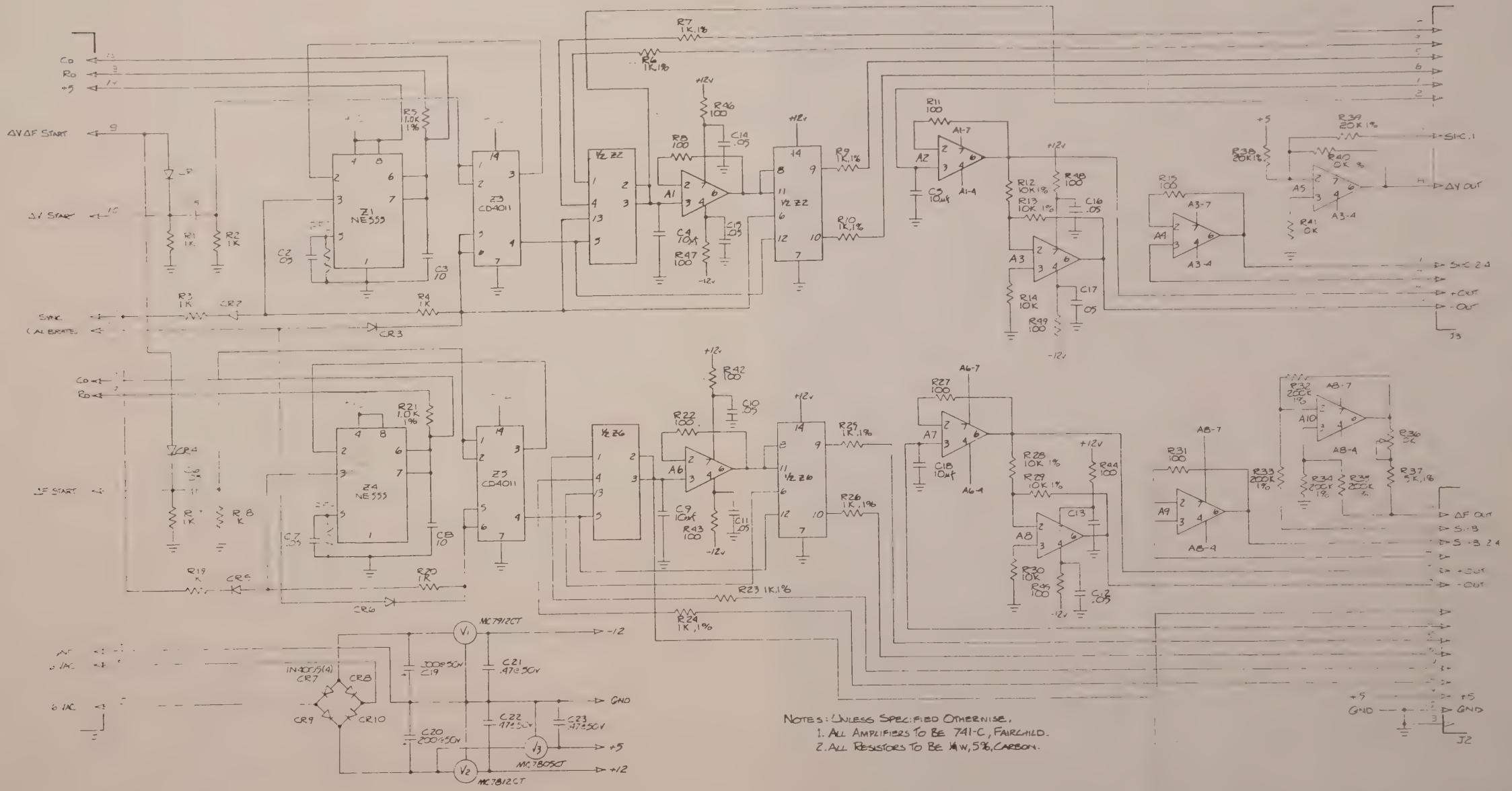


FIGURE 2.2.1
— TRANSIENT GENERATOR BOARD —
SCHEMATIC DIAGRAM

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DATE 7-15-78

TRANSIENT GENERATOR

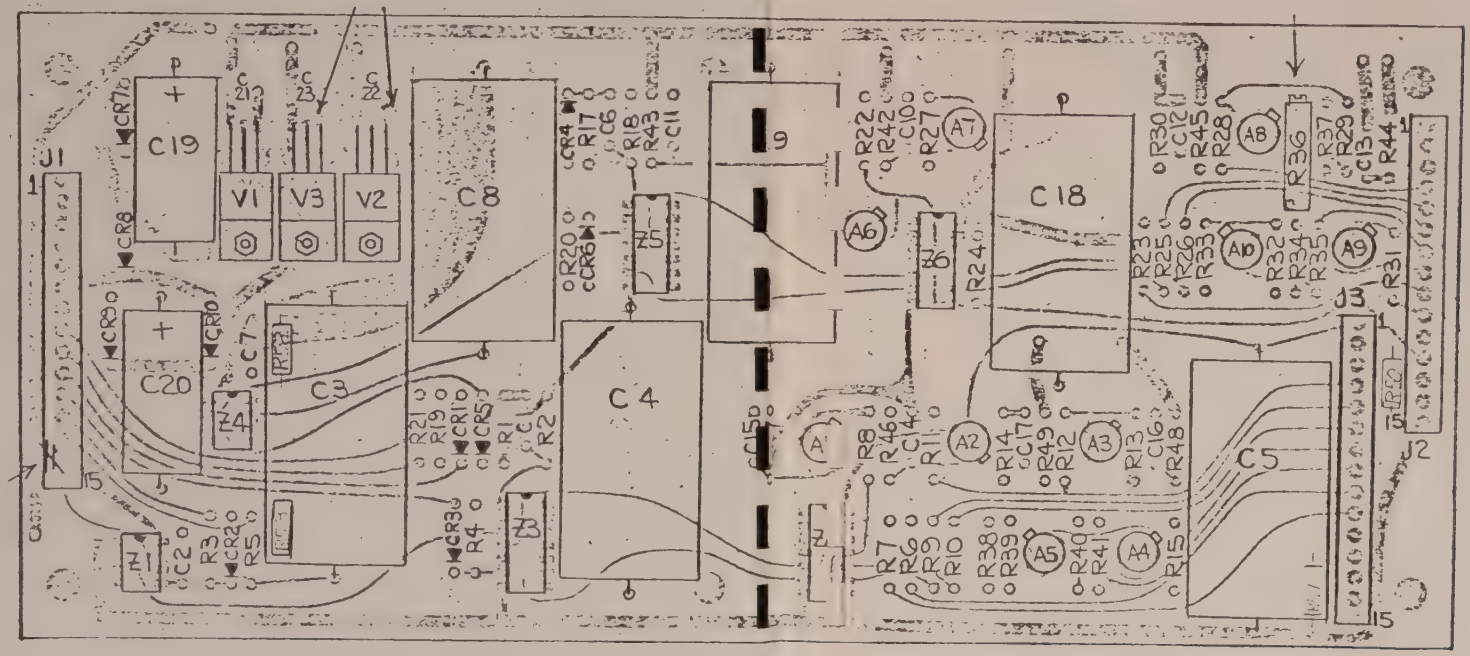

FIGURE 2.2.2
TRANSIENT GENERATOR BOARD
ASSEMBLY DRAWING

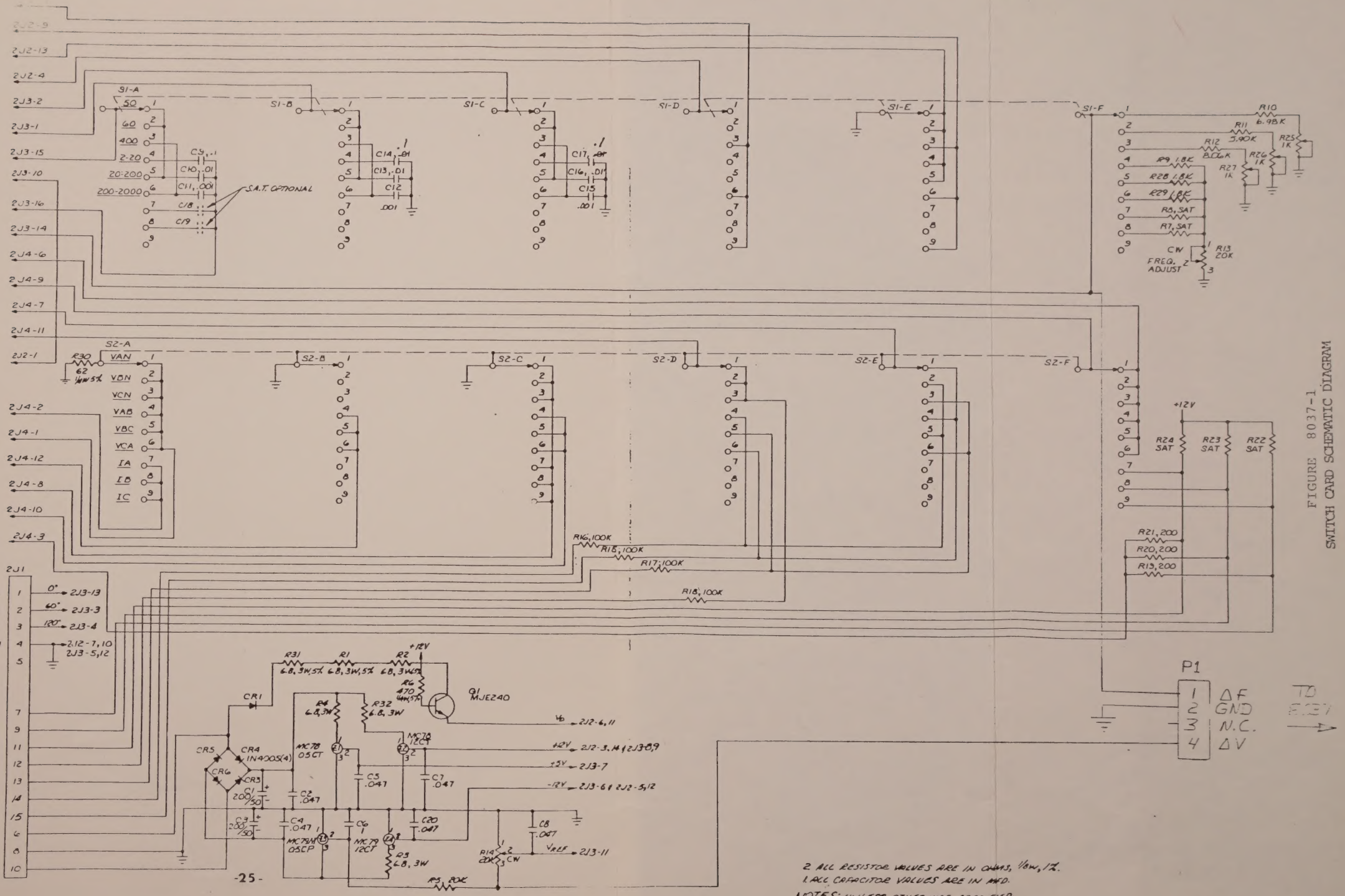

FIGURE 8037-1
SWITCH CARD SCHEMATIC DIAGRAM

2 ALL RESISTOR VALUES ARE IN OHMS, 1/8W, 1%.
1 ALL CAPACITOR VALUES ARE IN MFD.
NOTES: UNLESS OTHERWISE SPECIFIED.